REMARKS

In the present Office Action, claims 1-11 were examined. Claims 1-11 are rejected, no claims are objected to, and no claims are allowed.

By this Amendment, claims 1 and 10 have been amended, no claims have been canceled, and no claims have been added. Accordingly, claims 1-11 are presented for further examination. No new matter has been added. By this Amendment, claims 1-11 are believed to be in condition for allowance.

The present Office Action is apparently in response to Applicant's Appeal Brief. It is assumed that this Office Action is being mailed instead of an Examiner's Answer. In the present Office Action, the Examiner rejected claims 21-24 under 35 U.S.C. §112, second paragraph and under 35 U.S.C. §103(a). However, claims 21-24 were cancelled along with claims 12-20 in the Amendment dated February 21, 2003. Also note that Applicant's Appeal Brief noted that claims 21-24 were cancelled. Accordingly, this Response will not deal with these cancelled claims 21-24 since these matters are moot.

The above amendments to claims 1 and 10 are made to better describe the present invention. The new claim term "high copper alloy" in claim 1 has basis on pages 1 and 3 of the present specification and is defined in the first paragraph of page 2 of the specification.

The new claim phrase "having resistance to stress relaxation superior to copper alloy C19500" has basis on page 3, lines 22 and 23 of the present specification.

The claim terms "having a tensile strength in excess of 70 ksi" and "having an electrical conductivity in excess of 40% IACS" have basis at page 4, lines 2 to 4.

In paragraphs 1 and 2 of the present Office Action, the Examiner asked for the cancellation of non-elected claims 12 to 20. However, these non-elected claims 12 to 20 have already been cancelled so these remarks by the Examiner are deemed to be moot.

The Present Invention

The present claimed invention is directed to a copper alloy having resistance to stress relaxation superior to copper alloy C19500 at elevated temperatures consisting essentially of selected amounts of iron, nickel, tin, phosphorous and zinc with the balance being copper and inevitable impurities, said copper alloy having a relief anneal temper and

requires that the copper alloy have particular ultimate tensile strength and electrical conductivity values (claims 1 to 8 and 10) as well as copper alloys formed into electrical connectors (claims 9 and 11).

The copper alloys of the present claims fall within a class of alloys called "high copper alloys", which are wrought copper alloys with a copper content of less than 99.3% but more than 96%. Known prior art members of one subset of this class included alloys containing amounts of iron, tin and phosphorous. This copper alloy of this prior art subset are characterized by high electrical conductivity, but relatively poor resistance to stress relation at temperatures exceeding 125°C (see page 2 of the present specification).

The presently claimed alloys of the present are a sub-subset of this class of high copper alloys. Specifically, the present invention is directed to copper alloys that broadly contain:

from 0.8% to 3% by weight of iron;
from 0.3% to 2% by weight of nickel;
from 0.6% to 1.4% of tin;
from 0.005% to 0.35% of phosphorous;
less than 0.2% of zinc; and
the balance copper and inevitable impurities.

The claimed copper alloys of the present invention claim are made by a processing sequence described on pages 6 and 7 and the Examples as well as Figure 1. This processing sequence included a Relief Annealing (RA) step. The resulting alloy has a desired relief anneal temper. See page 7, lines 14-17 and 19-21 as well as page 9, lines 9-11 and page 11, lines 11 to 18.

The preferred claimed copper alloys of the present invention has several desirable properties not obtained by the above-noted prior art subset. They have enhanced resistance to stress relaxation (see claim 1) as well as having an ultimate tensile strength in excess of 70 ksi, and an electrical conductivity in excess of 40% IACS. In other words, the high copper alloys have a superior combination of properties that are achieved by the combination of (1) certain constituents (and amounts of those constituents) in the high alloy with a certain process of making that high copper alloy (i.e. one that has a relief anneal temper).

Rejections/Objections under 35 USC §112

The Examiner rejected claims 21-24 under 35 U.S.C. §112, second paragraph. Applicant respectfully traverses this rejection for the following reasons. The Examiner urges that the limitations in claims 21-24 are unclear as to whether the claimed alloy is being treated or was treated in a relief anneal temper step. As noted above, claims 21-24 were previously cancelled. This rejection is thus rendered moot by that previous cancellation.

Rejections under 35 USC §103

The Examiner rejected claim 1-11 and 21-24 under 35 U.S.C. §103(a) as being obvious and unpatentable in view of Knorr et al. (U.S. Patent No. 4,605,532) or JP11-264037 (Japanese Patent Application No. 11-264037A) or JP61-266540 (Japanese Patent Application No. 61-266560). Applicant respectfully traverses this rejection for the following reasons.

This Knorr et al. references teaches a copper base alloy which contains:
from 0.3 to 1.6% by weight iron; of which up to one-half can be replaced by Ni;
from 0.01 to 0.20% by weight Mg;
from 0.10 to 0.40% by weight P;
up to 0.5% by weight Sn; and with balance being Cu.

This reference makes no mention of the presence of Zn and also differs from the present invention in the percentage of tin (i.e. this reference teaches the presence of "up to 0.5% Sn" versus "0.6 to 1.4% tin" in claim 1 and narrower ranges in claims 6, 7 and 10).

Also, while this reference makes a statement that "the alloys may be stress relief annealed, if desired" (see col. 6, lines 61-62) there are no specific mention of any conditions for doing so or any mention in Knorr et al. of making a product that has a relief annealing temper or that it helps achieve enhanced resistance to stress relation. Furthermore, nowhere is there any mention of any of the specific alloys in this reference having relief annealing temper.

Japanese Patent Application JP11-264037 is directed to a copper alloy foil that contains:

from 0.05% to 3.5% by weight of Fe;
from 0.01% to 0.4% by weight of P;
from 0.05% to 5% of Zn;
from 0.5% to 3% of Sn; and
from 0.01% to 2% Ni (among other elements)

This copper foil has sufficient strength and electrical conductivity and may be used for printed circuit boards and in semiconductor mounting. See Abstract on page 2 of English translation.

It is noted that the copper alloy produced has "sufficient strength and electrical conductivity". See page 8, lines 6 to 9.

While the manufacturing process for producing this alloy includes "an aging treatment [at 300 to 700°C] for the purpose of obtaining the desired strength and electrical conductivity". See pages 11 and 12 paragraphs [0017] and [0018]. No mention is made of relief annealing or the presently discovered and claimed advantage of enhanced resistance to stress relaxation. More importantly, this reference does not teach or suggest that this alloy has achieved a "relief annealing temper".

The JP61-266540 teaches a copper-based alloy useful for semiconductor lead frames that contain:

0.5-3% Fe
0.4 - 2% Ni
0.01-0.5% P
0.15-1.5% Sn

The abstract does not teach the presence of less than 0.2% Zn in its alloys.

While this reference teaches the alloy showed Vickers hardness 154 and electrical conductivity of 48% IACS, no mention is made of relief annealing or the presently discovered and claimed advantage of enhanced resistance to stress relaxation. More importantly, this reference does not teach or suggest that this alloy has achieved a "relief annealing temper".

To summarize, Knorr et al. differs from the presently claimed invention in at least three (3) ways: (1) it does not teach or suggest copper alloys having "0.6 to 1.4% tin"; (2)

it does not teach or suggest that the final alloys possess a relief annealing temper; and (3) it does not teach or suggest copper alloys having enhanced resistance to stress relaxation.

JP 11-264037 differs from the presently claimed invention at least two ways: (1) it does not teach or suggest that its taught copper alloys may be relief annealed or achieve a relief annealing temper; and (2) it does not teach or suggest that its taught copper alloys possess enhanced resistance to stress relaxation.

JP 61-266540 differs from the presently claimed invention in at least three ways: (1) it does not teach or suggest that its alloys must have less than 0.2% Zn; (2) it does not teach or suggest that its copper alloys may be relief annealed or achieve a relief annealing temper; and (3) it does not teach or suggest that its taught copper alloys possess enhanced resistance to stress relation.

With regard to the obviousness rejection of claims 1-11 over Knorr et al., taken in view of either of the Japanese Published Patent Applications, the Examiner did not directly address the patentability of the relief annealing temper limitation. The Examiner merely stated in paragraph 9 that claims 21-24 were product-by-process claims, but did not address the patentability or non-patentability of this property in claims 1-11. With regard to claimed limitation "enhanced resistance to stress relaxation", the Examiner stated the following in paragraph 9 of the Final Rejection:

> The cited reference(s) disclose(s) the features including the claimed Cu base alloy composition, electrical conductivity, and/or tensile/hardness properties. The difference between the reference(s) and the claims are as follows: with respect to claim 10, that cited references do not disclose the remaining stress at 150°C after 3000 hours exposure. However, since the alloys of cited references have alloy composition and tensile property at an ambient temperature overlap the claimed alloy, it is believed that the remain stress at the claimed condition would be overlapped. Therefore, the burden is on the applicant to prove that the product of the prior art does not necessarily or inherently possess characteristics attributed to the claimed product. In re Spade, 911 F.2d 705, 708, 15 U.S.P.Q. 2d 1655, 1658 (Fed. Cir. 1990) and In re Best, 195 U.S.P.Q., 530 and MPEP 2112.01.

On page 11, [paragraph 0015] of the English translation of Japanese Published Patent Application No. 11-264037, it is stated that "(Mg, Co, Pb, Zr, Cr, Mn, Al, Ni, Si, In

or B) all have the action of improving the strength of the aforementioned copper alloy". However, in Table 1, (see page 14 of the English translation), no actual Examples were conducted with nickel (Ni). Thus, the teachings this reference could not recognize that the inclusion of nickel, along with a relief anneal temper, would produce the additional benefit of "enhanced resistance to stress relation".

Table 3 of the present specification contains a comparison of C19500 alloy (which contains Cobalt) has undesirable lower "Percentage Stress Remaining-Long." as compared to similar copper alloys that contain nickel instead (e.g. H898 and H899). Specially, at 125°C and 3000 hours, copper alloy H898-A which has been relief annealed (RA) has a percentage stress remaining-long of 87% whereas copper alloy C19500-RA has a corresponding lower value of 79%. Likewise, H898-B-RA has a corresponding value of 86%; H898-D-RA has a corresponding value of 87%; and H899-A-RA has a corresponding value of 83%. Thus, four nickel-containing alloys of the present invention have enhanced resistance to stress relaxation compared to a similar cobalt-containing copper alloy.

Moreover, it should be noted that a comparison of the "Percentage Stress Remaining-Long." in Table 3 (emphasis added) of the present specification between copper alloys that were not relief annealed (designed as "F") and those that were relief annealed (designated as "RA") clearly shows enhanced resistance stress relation in each case where relief annealing was employed (i.e. look at the two H898-A tests, the two H899-A tests and the two C-19500 tests). In each of these three side-by-side tests (with and without relief annealing), the same alloys that were relief annealed were higher (i.e. at 125°C and 3000 hours - 87% versus 72% for H898-A; 83% versus 70% for H899-A and 79% versus 65% for C19500). Accordingly, contrary to the Examiners comment, Table 3 does provide data that the present claimed copper alloys having a relief anneal temper provides enhanced resistance to stress resistance.

It is also noted that the Examiner did not comment on the differences in alloy constituents in JP 61-266540 and the Knorr et al. references.

There is no teaching or suggestion in any of the three applied references to motivate the ordinarily skilled artisan to prepare the present claimed copper alloys with a relief annealing temper so as to achieve the desired property of enhanced resistance to stress relaxation.

The Examiner also rejects claims 1-11 and 21-24 under 35 U.S.C. §103(a) as obvious over the references applied above [Knorr (U.S. Patent No. 4,605,532) or JP11-264037 (Japanese Patent Application No. 11-264037) or JP61-266540 (Japanese Patent Application No. 61-266540)], taken in view of Knorr (U.S. Patent No. 4,605,532).

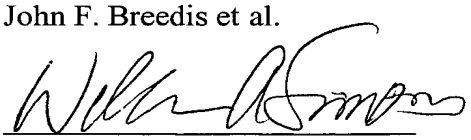
This rejection does not make sense since Knorr et al. is both a primary reference and a secondary reference.

Accordingly, Applicant submits that none of the references, alone or in combination, anticipate or make obvious the invention as presently claimed and that the application is now in condition for allowance. Therefore, Applicant respectfully requests reconsideration and further examination of the application and the Examiner is respectfully requested to take such proper actions so that a patent will issue herefrom as soon as possible.

If the Examiner has any questions or believes that a discussion with Applicant's attorney would expedite prosecution, the Examiner is invited and encouraged to contact the undersigned at the telephone number below.

Please apply any credits or charge any deficiencies to our Deposit Account No. 23-1665.

Respectfully submitted,
John F. Breedis et al.



Date: February 9, 2004
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